Maplets for Calculus: A CAS-Enabled Study Guide for Calculus

Abstract:
Maplets for Calculus (M4C) is an electronic study guide designed to address many of the problems of existing paper study guides, online homework systems and human tutors. M4C currently consists of 129 Maplets (Java applets written in Maple with full access to the Maple CAS) which help students learn specific concepts in precalculus, univariate calculus, and multivariate calculus. Each applet, (1) presents an algorithmically-generated problem, (2) requires correct intermediate responses before progressing to the next step, and (3) employs the Maple CAS to analyze student responses and provide context-specific hints & feedback. The maplets use a combination of symbolic, graphic (2D, 3D or 3D stereo, still or animated) , numeric and verbal devices to investigate problems.
Study guides, such as the Schaum's Outlines, have a very limited number of examples, and students see the full solution all at once. Most online homework systems have limited variation in the randomly generated problems and again students only see the whole solution at the end of the problem. In both, the absence of intermediate feedback makes it difficult for students to identify potential errors. By contrast, M4C applets have an essentially infinite number of problems requiring algebraic answers, and give immediate feedback preventing students from proceeding based on wrong assumptions. Some online homework systems now contain a CAS, but none of them use its power to the same extent as M4C. Human tutors, although still better than a computer in most regards, are just too expensive for most students. In short, M4C is a "tutor without the tutor".
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Authors:
Philip Yasskin Texas A&M University
Douglas Meade   University of South Carolina
Matthew Barry   Texas A&M University